SANDAKANIA 4 (1994): 87-91

A note on root sucker production in the conifer, *Dacrydium xanthandrum* (*Podocarpaceae*) on Mount Kinabalu, Sabah

K.M. Wong

Forest Research Centre, Sepilok
P.O. Box 1407, 90008 Sandakan
Sabah, Malaysia

Summary. Root suckers of the conifer, *Dacrydium xanthandrum* Pilger were observed on Mt Kinabalu, Sabah, in northern Borneo. They may be important in the clonal propagation of individuals where lateral roots extend in the exploration of new substrate and sites suitable for the establishment of new plants are occupied by such root suckers.

Root suckers have been documented for a small number of tropical and temperate plants, although their significance in tropical forests have been little discussed. For example, they are known to be produced by *Fagus grandifolia* Ehrh. (the American beech, Fagaceae) (Horn 1975), *Cinnamomum camphora* (L.) J. Presl (the camphor of China and Japan, Lauraceae) (Barlow, Enoch & Russell 1991), *Millingtonia hortensis* L. (the Indian Cork Tree, Bignoniaceae) (Backer & Bakhuizen 1965, van Steenis 1977, Corner 1988), *Artocarpus incisa* Thunb. (the breadfruit tree of the Indo-Pacific islands, Moraceae), *Cecropia* spp. (pioneer and secondary forest trees of the neotropics, Cecropiaceae), *Eucalyptus globulus* Labill. (the Australian blue gum tree, Myrtaceae), *Musanga cecropioides* R. Br. (the tropical African umbrella tree, Cecropiaceae), *Populus* spp. (the poplars, Salicaceae), *Psidium guineense* Sw. (the guisaro of tropical America, Myrtaceae), *Sequoia sempervirens* (D. Don) Endl. (Californian redwood, Taxodiaceae) (Halle, Oldeman & Tomlinson 1978), *Euclinia longiflora* Salisb. (the African Angel's Trumpets, Rubiaceae), *Ixora coccinea* L. (India to Indo-China and south China, Rubiaceae), *I. finlaysoniana* Don (Thailand, Rubiaceae) (Wong 1989), and *Vitex pinnata* L. (the Malayan *leban*, a common pioneer and secondary forest tree, Verbenaceae) (Wong, unpublished observation).

Up to now, root-sucker production appears to be known only for temperate forests or pioneer, secondary forest or forest-fringe species in the tropics; examples of root suckering in species of primary, undisturbed high tropical forests are lacking; either this is a relatively rare phenomenon or one difficult to observe in high tropical forests. van

Steenis (1956) has noted that root suckers are more frequently encountered among what he called "biological nomads", or sun-loving plants with characteristically short life spans. Wong (1989) observed that whereas root suckers are known in some seasonal-climate species of Rubiaceae, they are not known to be produced by the rain forest species of this large family.

Halle, Oldeman & Tomlinson (1978) point out that the root suckers of several species they have studied reiterate, or reproduce, the growth architectural model of the plant completely, in effect producing potential new plants that are clones of the parent. They distinguish two processes, that of "neo-formation" of meristems in the formation of root suckers, and the activation of latent meristems in the development of stem-base suckers. Kormanik & Brown (1967) suggested that the ability to produce root suckers is determined genetically. van Steenis (1977) concludes that *Millingtonia hortensis* is successful in dry monsoonal areas because it is fire-resistant by its thick corky bark and profuse root sucker production, and Halle *et al.* (1978) consider root suckering one of the most efficient ways for a plant to achieve self-replacement. Horn (1975) found that root suckering was ecologically significant in the case of *Fagus grandifolia*, and that it was not merely an efficient repair mechanism, but also a means of vegetative spread into new territory.

Fig. 1. Root suckers produced along superficial lateral roots of *Dacrydium xanthandrum*.

Root suckers of *Dacrydium xanthandrum*

Root suckers have been observed for a number of trees of the conifer, *Dacrydium xanthandrum* Pilger, in the montane forest at 1800 m elevation on Marai Parai, a spur on the west side of Mt Kinabalu in Sabah, northern Borneo (Fig. 1), where this species was common and grew in dense peaty forest together with species like *Falcatifolium falciforme* (Parl) de Laub., *Leptospermum recurvum* Hk. f. and *Scaevola micrantha* Presl. Root suckers were observed only in trees at the fringe of the forest, where the vegetation was sparse and the substrate much less peaty and even rocky. It was difficult to ascertain if any of the sapling-like individuals within the peaty forest were root suckers or have originated as such, because there the vegetation and root mass on the forest floor were very dense, making excavation difficult. It is also not known if root sucker development by these trees was inhibited by peaty or other conditions within the forest, as apparently they were common only at the forest fringe.

Fig. 2 shows the extent of root sucker production for a selected forest-fringe tree of *D. xanthandrum* which has a stem basal diameter of 34.4 cm. The root suckers farthest from the stem of this tree were about 6 m away, and a number of suckers had developed sizeable stems of their own, the largest measuring 19 cm diameter at the base.

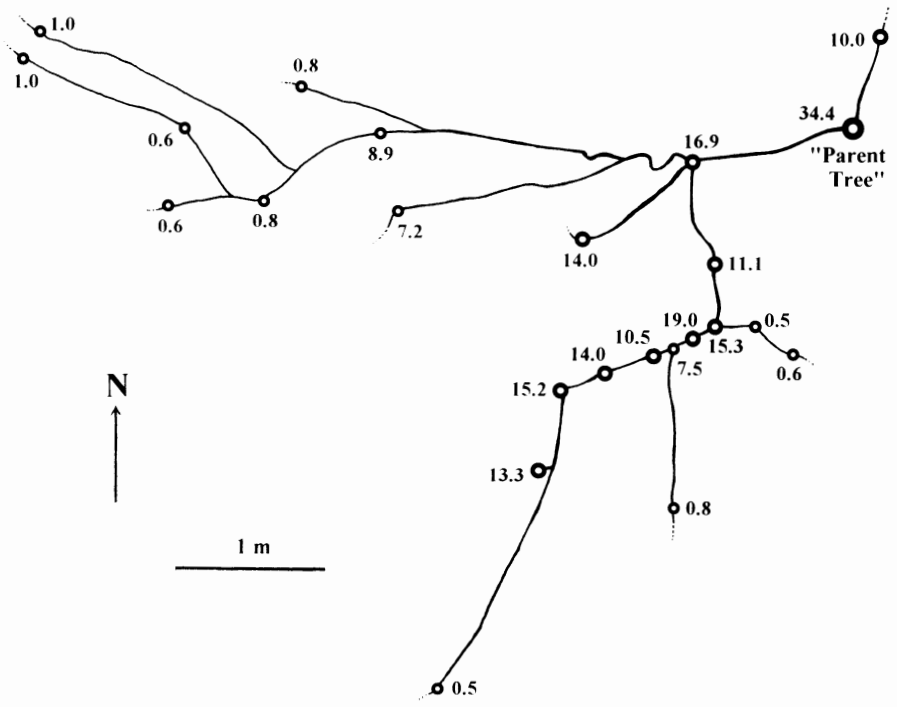

Fig. 2. The distribution of root suckers produced by an individual tree of *Dacrydium xanthandrum* on the Marai Parai spur on Mt Kinabalu.
Numbers are basal stem diameters in centimetres. The dense peaty forest is to the east, and the sparsely wooded, sedge-dominated, rocky open area begins westward.

For the forest-fringe trees observed having root suckers, the greatest extent of development of superficial lateral roots and root suckers was in a direction away from the peaty, dense forest and towards the sparsely wooded, open area dominated by *Machaerina* and *Scleria* sedges. This may indicate that lateral root extension into sites with sparse tree cover and root sucker production in *D. xanthandrum* may serve for the exploration of new substrate by the clone and as a means of vegetative reproduction. The root suckers had the same growth architecture as the parent plant and a number had developed their own root masses at their stem bases, so that conceivably fragmentation of the lateral roots connecting suckers to the parent plant may produce physiologically independent clones. It was not possible, however, to determine if physically separate young plants scattered around root-suckering trees had in fact originated as root suckers. The trees observed having such root suckers did not show signs of damage, so that root sucker production in these trees appear not to be the kind of "repair" response discussed by Halle *et al.* (1978). However, it is not known, without conducting wounding experiments, if root sucker formation was correlated to physical damage to the lateral roots that bear them.

ACKNOWLEDGEMENTS

I thank the Sabah Parks Department and Parks Ecologist Jamili Nais, who organised the expedition to Marai Parai on Mt Kinabalu in September 1993, when these observations were made. A. Berhaman, L. Madani, Sulaiman Talip, Baraham Buhari, Donggop Tokilip, Suin Gambukas, and Gambiyo Loloh of the Forest Research Centre, Sepilok, Sandakan, Sabah, assisted in mapping the distribution of root suckers.

REFERENCES

Backer, C.A. & R.C. Bakhuizen van den Brink (1965) Flora of Java, Vol. 2. N.V.P. Noordhoff: Groningen, the Netherlands.

Barlow, H.S., I. Enoch & R.A. Russell (eds.) (1991) H.F. MacMillan's Tropical Planting and Gardening. 6th edition. Malayan Nature Society: Kuala Lumpur.

Corner, E.J.H. (1988) Wayside Trees of Malaya. 2 vols. 3rd edition. Malayan Nature Society: Kuala Lumpur.

Halle, F., R.A.A. Oldeman & P.B. Tomlinson (1978) Tropical Trees and Forests: an Architectural Analysis. Springer Verlag: Berlin.

Horn, H.S. (1975) Forest Succession. Scientific American 232 (5): 90-98.

Kormanik, P.P. & C.L. Brown (1967) Root buds and the development of root suckers in the sweetgum. Forest Science 13: 338-345.

Steenis, C.G.G.J. van (1956) Rejuvenation as a factor for judging the status of vegetation types: Biological nomad theory. UNESCO, Actes Coll. Kandy, pp. 212-218.

Steenis, C.G.G.J. van (1977) Bignoniaceae. Flora Malesiana 1, 8: 114-186.

Wong, K.M. (1989) Book review: Tropical Woody Rubiaceae, by E. Robbrecht. Gardens' Bulletin, Singapore 42: 75-77.